

AMENDMENTS TO THE DRAWINGS

The attached two sheets of drawings include changes to Fig. 1 and Fig. 6. These sheets, which each include only one Figure, replaces the original sheets including only Fig. 1 and Fig. 6, respectively. In Fig. 1, the labels have been added to the boxes as required by the Examiner. In Fig. 6, the legend and graphed curves have been updated simply to be able to better distinguish between each other.

Attachment: Two Replacement Sheets
 Two Annotated Sheets Showing Changes

REMARKS

Claim status

Claims 1-18 were pending in the case at the time of the current Office Action. Claims 1 and 8 are currently amended herein. Claims 7 and 18 are cancelled herein. Claims 1-6 and 8-17 are currently pending in the application.

Drawing rejections

In the current Office action, the drawings are objected to because the unlabeled rectangular boxes shown in Fig. 1 should be provided with descriptive text labels.

Applicants respectfully traverse the foregoing objection in view of the above amended drawings and for reasons set forth hereafter.

The descriptive text labels have been added to the rectangular boxes. One replacement sheet and one annotated sheet are provided herewith. No new matter has been added.

Applicants respectfully request that the amended Figure be entered and that the objection be withdrawn.

Applicants respectfully request that the updated Fig. 6 be entered as well. In Fig. 6, the legend and graphed curves have been updated simply to be able to better distinguish between each other. No new matter has been added.

Double Patenting

In the current Office action, claims 1 and 2 are provisionally rejected on the ground of non-statutory obviousness-type double patenting as being unpatentable over claims 14 and 15 of co-pending Application No. 10/674,280, respectively.

Applicants respectfully traverse the foregoing rejections in view of the above pending claims and for reasons set forth hereafter.

Claim 1 has been amended herein to include the elements of claim 7. Applicants respectfully submit that the amendment of claim 1 herein overcomes the rejection.

Applicants respectfully request that the double patenting rejection be removed.

Section 102 rejections

In the current Office action, claims 1-3 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Esteller et al. (US Patent No. 6,594,524).

Applicants respectfully traverse the foregoing rejections in view of the above pending claims and for reasons set forth hereafter.

Independent claim 1 recites an apparatus for the classification of physiological events, comprising:

- a signal input for the input of a physiological signal representing or constituting a physiological event;

- a classification unit for classifying the physiological signal on the basis of its signal shape, the classification unit comprising:

- a transformation unit which is designed to carry out transformation of the physiological signal in such a way that as the output signal it outputs a number of values representing the physiological signal and based on the transformation; and

- a probabilistic neural network which is connected to the transformation unit to receive the values and which contains a number of event classes which represent physiological events and which in turn are each represented by a set of comparative values, which probabilistic neural network is adapted on the basis of the comparison of the values with the comparative values to effect an association of the physiological signal represented by the values with one of the event classes; and

- an adjusting unit for centering the physiological signal in a time window of predetermined window width and for outputting the centered physiological signal to the transformation unit, the adjusting unit connected upstream of the transformation unit.

It is respectfully submitted that Esteller et al. (U.S. Pat. No. 6,594,524), hereinafter Esteller, does not teach or suggest the invention of independent claim 1. In particular, Esteller does not teach or suggest a centering of a physiological signal in a time window. The

physiological signal is centered in the time window in order to avoid the negative effects of an offset (i.e., an un-centered) signal, which is described in the present application and re-iterated herein below.

Instead, Esteller describes using a running window for the purpose of periodically shifting the window to compute features. Esteller is not concerned at all with generating a centered physiological signal, as is the claimed invention of claim 1, and gives no reason for why one might want to center the physiological signal in a window. Instead, in Esteller, feature extraction is performed through a running window method. A sliding observation window moves through the data as the features are computed. The data points inside the sliding window of Esteller are used for feature generation as the window moves through the data.

The time window of the claimed invention of claim 1 is synchronized with detected events triggering a trigger signal to the adjusting/standardizing stage 28. If the detection stage 26 detects an event, it outputs a trigger signal (triggering signal) to the adjusting/standardizing stage 28 which triggers adjustment and/or standardization of the physiological signal. If the adjusting/standardizing stage 28 receives a trigger signal from the detection stage 26, the underlying IEGM is detected in an event window with a predetermined window width which is generally 64 sampling steps, and centered in the window. The window is adapted to the expected type of event. The procedure also involves ascertaining the time interval from the last-detected event to the present event and standardization of the signal shape to a standardized peak-to-peak amplitude on the basis of a standardization factor in order to obtain a standardized event signal. The adjusting/standardizing stage 28 transmits the time interval and the standardization factor to the probabilistic neural network 5 whereas it transmits the event signal which is standardized and centered in the window to the transformation unit 3.

The information concealed in the input signal is encoded after preparation of the input signal in the signal processing unit 20 in the transformation unit 3 by means of the wavelet transformation procedure. Wavelet transformation however is not invariant in relation to a time shift in the input signal in the signal window, that is to say the result of transformation changes if the maximum of the amplitude is moved forward or back by one or more sampling steps in the signal window. Consequently the values of the coefficients which are outputted by the

transformation unit and which are of substantial significance for classification can fluctuate. The degree of fluctuation depends on the accuracy of centering of the input signal in the signal window.

In the situation involving perfect centering of the signal in the signal window, that is to say in the case of an offset of the value zero, the node which represents the Haversine signal outputs an output value 1 for the Haversine signal as the input signal and an output value of about 0.25 for the triangular signal as the input signal. If on the other hand there is an offset by a sampling step in respect of centering of the Haversine signal or the triangular signal respectively in the signal window (offset + 1 or -1), then the output value for the Haversine signal as the input signal is reduced to about 0.55 and that for the triangular signal as the input signal is reduced to about 0.18.

The difference between the two output values shown in Figure 4 forms the basis of event classification by means of the probabilistic neural network 5. In that respect a great difference (as in the case of the offset 0...i.e., a centered signal) ensures a low level of susceptibility of the classification procedure in relation to signal noise. The reduction in difference by virtue of the offset of +1 or -1 (measured in sampling steps) to approximately half the value with an offset of zero has the result that, in the case of the offset of + 1 or -1 respectively classification errors already occur at noise levels which are half as high as the noise level at which classification errors occur with an offset of zero. That can result in a significant reduction in the operational efficiency of the apparatus, in many uses.

Esteller does not give any suggestion whatsoever to centering a physiological time signal in a time window or to the problems that may arise from an offset, un-centered signal as described above.

Therefore, in view of at least the foregoing, it is respectfully submitted that independent claim 1 is not anticipated by Esteller, and it is respectfully submitted that independent claim 1 defines allowable subject matter. Also, since claims 2-3 and 13 depend either directly or indirectly from claim 1, it is respectfully submitted that claims 2-3 and 13 define allowable subject matter as well. Applicants respectfully request that the rejection of claims 1-3 and 13 under 35 U.S.C. 102(e) be removed.

Section 103 rejections

In the current Office action, claims 4-9, 11-12, and 14-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Esteller in view of Echauz et al. (US Patent No. 6,678,548).

Applicants respectfully traverse the foregoing rejections in view of the above pending claims and for reasons set forth hereafter.

As described above, Esteller does not teach or suggest a centering of a physiological signal in a time window as does the claimed invention of claim 1. Furthermore, Echauz et al. (US Patent No. 6,678,548), hereinafter Echauz, does not teach or suggest a centering of a physiological signal in a time window as does the claimed invention of claim 1.

Therefore, in view of at least the foregoing and the fact that claims 4-6, 9, 11-12, and 14-17 depend either directly or indirectly from independent claim 1, it is respectfully submitted that claims 4-6, 9, 11-12, and 14-17 define allowable subject matter as well. Claims 7 and 18 have been cancelled herein. Applicants respectfully request that the rejection of claims 4-9, 11-12, and 14-18 under 35 U.S.C. 103(a) be removed.

In the current Office action, claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Esteller in view of Echauz and further in view of Igel et al. (US Patent No. 6,192,273).

Applicants respectfully traverse the foregoing rejections in view of the above pending claims and for reasons set forth hereafter.

As described above, Esteller does not teach or suggest a centering of a physiological signal in a time window as does the claimed invention of claim 1. Furthermore, neither Echauz nor Igel et al. (US Patent No. 6,192,273), hereinafter Igel, teach or suggest a centering of a physiological signal in a time window as does the claimed invention of claim 1.

Therefore, in view of at least the foregoing and the fact that claim 10 depends indirectly from independent claim 1, it is respectfully submitted that claim 10 defines allowable subject

matter as well. Applicants respectfully request that the rejection of claim 10 under 35 U.S.C. 103(a) be removed.

Accordingly, the applicant respectfully requests reconsideration of the rejections and objections based on at least the foregoing. After such reconsideration, it is urged that allowance of claims 1-6 and 8-17 will be in order.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'D.J. Muzilla', is written over a horizontal line.

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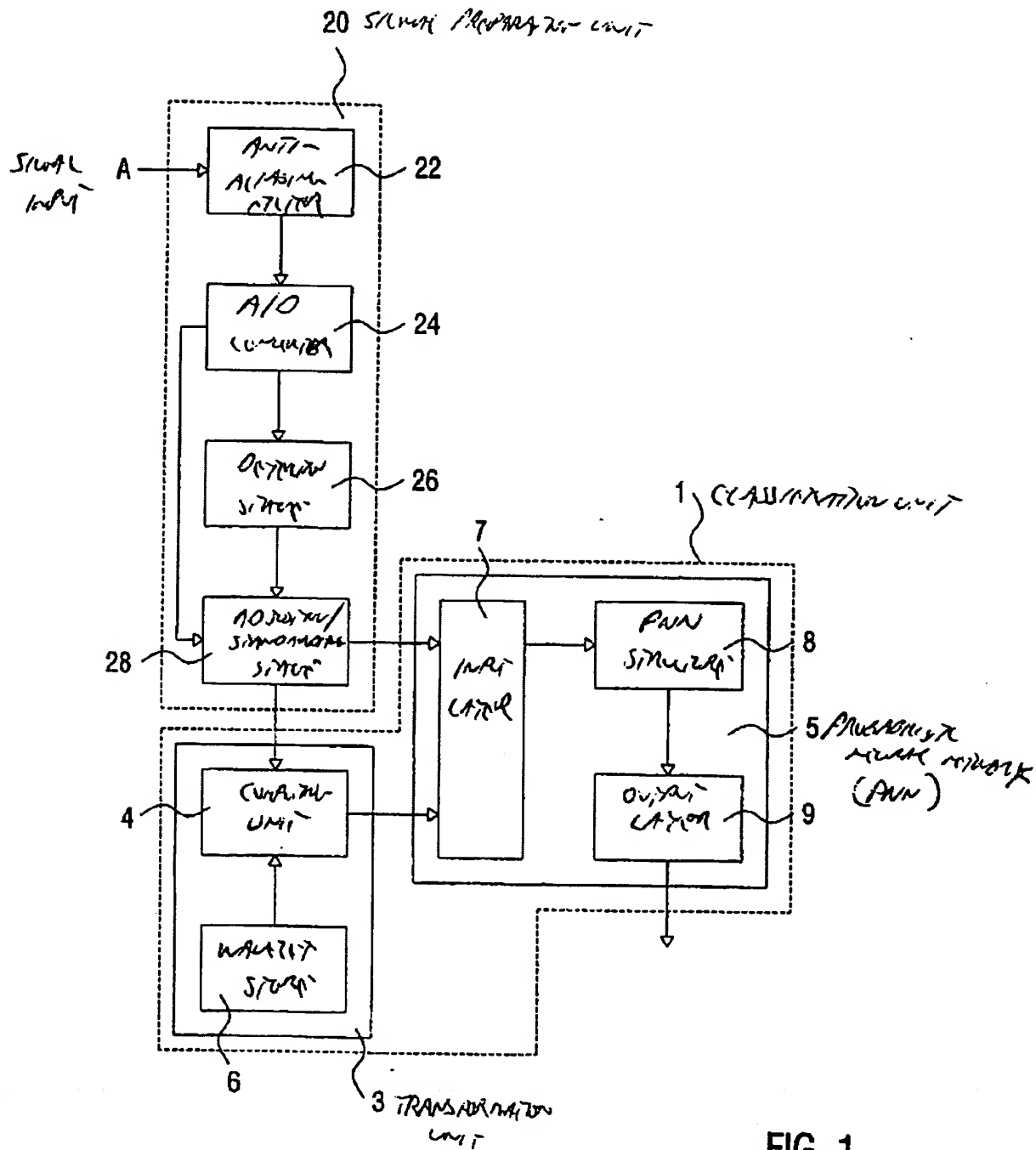


FIG. 1

Classification Error Rate for Various Sample Offsets, Using Dual Offset Pattern Nodes per Class

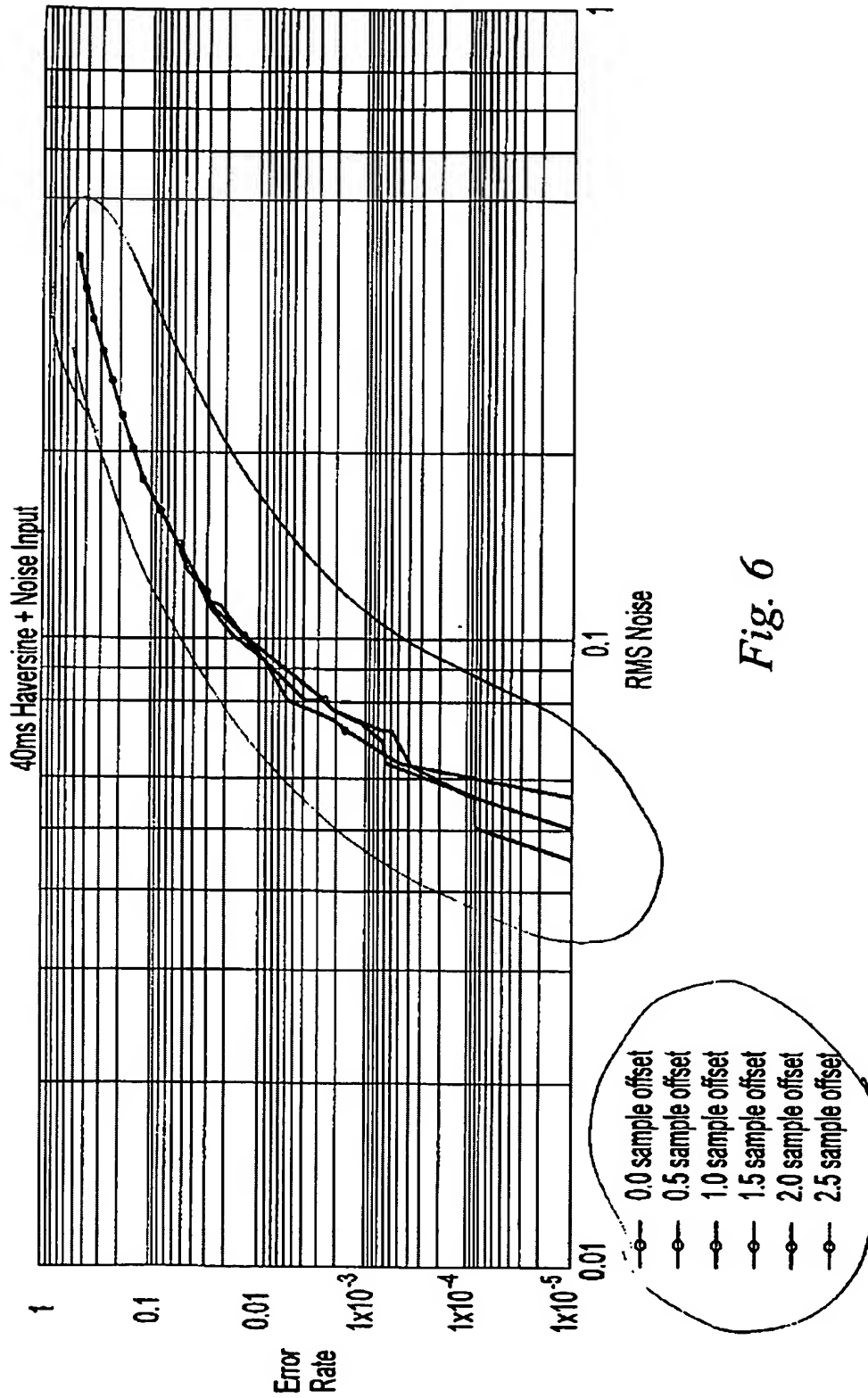


Fig. 6